What Is Claimed Is:

1.   A method for converting a frame-based animation into an interpolator-based animation, the frame based animation including a plurality of animation objects and a plurality of successive frames represented by frame instructions, the frames including a displayed group of the animation objects, the animation objects in the displayed group having associated display properties that change throughout the successive frames, the animation objects in the displayed group each appearing at a unique associated depth in the frames, the frame instructions identifying for each frame the animation objects from the displayed group appearing therein and the display properties and depth associated with each of the animation objects appearing therein, the method including steps of:

a) identifying each unique combination of animation object and associated depth identified in the frame instructions for the plurality of frames;

b) for each identified unique combination, identifying the display properties associated with the animation object of the combination through the successive frames; and

c) for each identified display property for each identified unique combination, creating an interpolator associated with the animation object of the combination which specifies any changes that occur in the display property for the specified animation object throughout the plurality of frames.

2.   The method of claim 1 wherein each unique combination of animation object and associated depth is identified by a unique key based on an identifier for the animation object and a value assigned to the associated depth.

3.   ￼The method of claim 1 wherein each animation object in the plurality of animation objects has a unique type identifier associated therewith, each of the depths having a unique depth value, wherein each unique combination of animation object and associated depth is identified by a unique key based on the depth value associated with the depth of the unique combination and on the type identifier associated with the

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animation object of the combination.

4.   The method of claim 3 wherein the key is a numerical value having first and second parts wherein a value for the first part is set based on the depth value associated with the depth of the unique combination and a value for the second part is set based on the type identifier associated with the animation object of the combination, the first part being a more significant part of the numerical value than the second part.

5.   The method of claim 1 wherein the frames of the animation object have an associated frame rate, wherein step (b) includes determining a relative time identifier for each change in each identified display property based on the frame rate and the number of frames, and step (c) includes specifying in each interpolator the relative time identifiers for each of the changes in the display property specified therein.

6.   The method of claim 1 wherein the frames have an associated frame rate specified in the frame instructions and steps (a), (b) and (c) collectively include steps of:
        (1) creating a key list, and for each animation object appearing in each frame identified in the frame instructions performing steps of:
                (i) generating a key that specifies an identifier associated with the animation object and a depth value associated with the depth at which the animation object appears;
                (ii) determining if the key is present in the key list and (A) if the key is not present in the key list, adding the key to the key list, creating a table that is associated with the key, and recording in the associated table the display properties associated with the animation object for the frame; and (B) if the key is present in the key list, determining if any of the display properties associated with the animation object have changed since being last recorded in the associated table, and if so, recording a key-time based on a relative location of the frame in the plurality of frames and the frame rate and updating the associated table to record, in association with

the key-time, any changes in the respective display properties associated with the animation object that have changed since the respective display properties associated with the animation object were last recorded;

(2) processing each table, including for each table creating an interpolator for each display property for which a change therein has been recorded in the table, the interpolator specifying (i) an identifier identifying the animation object associated with the key associated with the table; (ii) any changes in the display property occurring throughout the plurality of frames; and (iii) for each of the specified changes, a key-time assigning a relative time value to the change; and

(3) outputting as an interpolator based animation the plurality of animation objects and the interpolators.

7.   The method of claim 6 wherein prior to step (2), the key list is sorted into a descending order based on the depth values; in step (2) the tables are processed in an order based on of the keys in the key list; and in step (3) the interpolators are output in an order corresponding to an order in which the interpolators were created in step (2).

8.   The method of claim 1 wherein the plurality of animation objects includes shapes, images, buttons and text.

9.   The method of claim 1 wherein the display properties associated with the animation objects in the displayed group include position, visibility, color, scale, rotation and skew.

10.   The method of claim 1 wherein at least some of the frames include sprites, each sprite including a plurality of successive sub-frames, the sub-frames including a sprite displayed group of the animation objects, the animation objects in the sprite displayed group having associated display properties that change throughout the successive sub-frames, the animation objects in the sprite displayed group each appearing at a unique associated depth in the sub-frames, the frame instructions identifying for each frame

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any sprites appearing therein, and for each sprite the animation objects from the sprite displayed group appearing therein and the display properties and depth associated with each of the animation objects appearing in the sprite, the method including steps of:

a) for each sprite, identifying each unique sprite combination of animation object and associated depth identified in the frame instructions for the plurality of sub-frames of the sprite;

b) for each identified unique sprite combination, identifying the display properties associated with the animation object of the combination through the successive sub-frames; and

c) for each identified display property for each identified unique sprite combination, creating an interpolator that specifies the animation object of the combination and any changes that occur in the display property for the specified animation object throughout the plurality of sub-frames.

11. A converter for converting a frame-based animation into an interpolator based animation, the frame-based animation including a plurality of animation objects each having an associated type identifier and a plurality of successive frames represented by frame instructions, the frames including a displayed group of the animation objects, the animation objects in the displayed group having associated display properties that change throughout the successive frames, the animation objects in the displayed group each appearing at a unique associated depth in the frames, the frame instructions specifying for each frame the animation objects appearing therein, and display properties and associated depth of the animation objects appearing therein, the interpolator based animation including the plurality of animation objects and a plurality of interpolators, each interpolator being associated with a target display property of a target animation object type selected from the plurality of animation objects and specifying changes that occur in the target display property during a display duration, the converter including:

an input module for receiving a frame based animation and extracting the frame instructions therefrom;

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a converter module for (a) receiving the extracted frame instructions from the input module and based thereon identifying each unique combination of animation object and associated depth appearing in the plurality of frames, and (b) for each identified unique combination, identifying the display properties associated with the animation object of the combination through the plurality of frames; and

an output module responsive to the converter module for creating for each identified display property for each identified unique combination an interpolator specifying (i) the identified display property as a target display property, (ii) the animation object of the combination as a target animation object, and (iii) any changes that occur in the display property for the specified animation object throughout the plurality of frames.

12.   The converter of claim 11 wherein the converter module includes means for generating, for each identified unique combination, a unique identifying key based on a depth value associated with the depth of the unique combination and on the type identifier associated with the animation object of the combination.

13.   The converter of claim 12 wherein the key is a numerical value having first and second parts wherein a value for the first part is set based on the depth value associated with the depth of the unique combination and a value for the second part is set based on the type identifier associated with the animation object of the combination, the first part being a more significant part of the numerical value than the second part.

14.   The converter of claim 13 wherein one of the converter module and output module is configured for sorting the identifying keys based on the first part, and the output module is configured for outputting the interpolators in an order that corresponds to the sorted identifying keys of the unique combinations that the interpolators have been created for.

15.   The converter of claim 11 wherein the plurality of successive frames have an

associated frame rate, wherein the converter module is also for determining a relative time identifier for each change in each identified display property based on the frame rate and the relative location of the frame in which the change occurs in the plurality of frames, and specifying in each interpolator the relative time identifiers for each of the changes in the display property specified therein.

16.   The converter of claim 15 wherein the time identifiers are normalized such that each of the time identifiers has a value between zero to one.

17.   The converter of claim 11 wherein the plurality of animation objects includes shapes, images, buttons and text.

18.   The converter of claim 11 wherein the display properties associated with the animation objects in the displayed group include position, visibility, color, scale, rotation and skew.

19.   The converter of claim 11 wherein the interpolator-based animation is outputted in an XML compliant format with the interpolators represented as animate tags.

20.   The converter of claim 19 wherein at least some of the animation objects in the interpolator-based animation are represented as path elements in the XML compliant format.